

Students Continue Research Throughout Summer

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(HDL).

Her laboratory examined mice with and without the *pank3* gene and drew the mice's blood in order to test for HDL levels.

Typically working from 8-5, Valdes says she did minimal data analysis and more lab work, some of which included open heart surgery on mice—perfusion and all. Throwing her head back, Valdes gushes, "It was one of the best summers that I've had, period. And I already miss people!...I worked in a fun lab. They had a really work hard, play hard mentality."

While Valdes pursued science after Science and Math let out for the summer, Damien Jiang conducted math research. Jiang joined 80 of the world's most accomplished high school students at the Massachusetts Institute of Technology for the highly selective Research Science Institute (RSI). His specific research project? The parallel chip-firing game on graphs. Confused? Jiang elaborated further. "Specifically, complete bipartite graphs."

Jiang set out to explain the mathematics in simpler terms. "Okay, so analogy: You have a bunch of people. And each person has some number of friends—and...let's say candies. So, the people don't want to get fat. So, if a person has at least as many candies as friends, he gives one candy to each friend, and every person

will do this at the same time. So the configuration of candies and people at the next step is completely determined by the current step—and that means, because there are only finitely many configurations, that the configuration—'position'—will repeat eventually. And so the least number of moves before the position repeats is the 'period' of the game."

A configuration is the set of people, their "friend" connections, and the number of candies each person has. "The configuration is the whole thing. You imagine the people as dots, and friendships as connections between the dots, and put some number of candies on each dot. The configuration is the whole drawing, along with the number of candies on each dot," explains Jiang.

In 1989, a conjecture was made regarding the parallel chip-firing game: the maximum period of any configuration on a certain graph with V number of vertices (i.e., a group of V people) is that number V . In 1994, this was disproven. Jiang's quest was to prove the 1989 conjecture for specific kinds of graphs: complete bipartite graphs.

His Research Science Institutes days were spent doing simulations on the computer, working on paper, working on the board, drawing graphs, computing with formulas, and talking to other students. "I had a [MIT] grad student as my mentor...I don't think I actually talked to any



Above, senior Damien Jiang is shocked by the intellect of his peers at MIT's Research Science Institute. He spent the summer there conducting mathematical research.

professors."

Working with two sets of points, Jiang constructed several positions that had the periods he said were the only ones could exist and proved that those were the only possible ones. What's next? "I'm still trying to generalize [the project's formula to fit] to n sets of points...to characterize all possible periods...and I'll be entering it into contests."

The camp was also complete with visits to islands in Boston Harbor, watching July 4th fireworks on the Charles River from up close, midnight trips to the Harry Potter movie, "Rocky Horror" viewings (that Jiang referred to as "R-rated weirdstuff" and did not attend), and plenty of dinner trips.

When asked to compare NCSSM and RSI, Jiang was reflective for a moment.

"Someone says to talk about the SLEEP DEFICIT, which is similar if not worse than NCSSM. I slept 3 AM-10 AM, but there were some who slept from like 3-7...the RSI people are a lot more intense, but similar in fun level...probably slightly more sketchy because there were fewer restrictions...guys/girls lived beside each other, no room restricting...and we could leave after 10:30 P.M. "bedcheck" and we'd have midnight frisbee/soccer/ping-pong anywhere on campus." There were also three dances. "One of the 'tutors,' who helped with scientific writing/presenting, was a really good DJ."

The RSI experience extended beyond science and mathematics research and basic camp activities into an unforgettable life experience

complete with interactions with many incredible and accomplished young individuals. "[It was] great. Awesome. Got my mind blown. The people there were so much smarter than me, but they were also cool—not many socially awkward people...One math kid knows more than I'll know in like, two years of college... There are like three, four people who made Nationals Physics camp. Five people who have been to National Math Camp (MOP) like I have. One girl went to Chemistry Olympiad last year...She made International Chemistry Olympiad [team] in 10th, National Physics Camp in 11th, and did bio at RSI...Everyone has like seven 5's on APs and blah blah, but yeah, that's not that exciting...One [17-year-old] guy has his own company, selling iPhone apps...[I made] plenty of friends."

Other academic activities that NCSSM students participated in during the summer included an intense study camp at the U.S. Air Force Academy to compete for one of the four spots on the International Chemistry Olympiad team, the National Health Occupations Students of America Competition, Texas Tech University's Clark Scholars Program, Howard Hughes Precollege Program in the Biological Sciences, Project SEED, Summer Ventures in Science and Mathematics (SVSM), and Governor's School.

Students Find Unique Ways To Serve Communities

By JENNIFER ZHU

When a student comes to NCSSM, he or she must pay a price; an estimated amount of \$54,000 is spent by the state on each student. It's no wonder students are expected to sacrifice a little in return—and no, that's not referring to having to eat PFM food for two years. Through 3 hours of required work service every week and 60 hours of summer service, students are expected to repay the community that gives so much to them, financially and beyond.

While many students log their summer service hours at a local hospital or soup kitchen, some students have unique experiences.

Junior Violette Zhu, for example, designed and painted the arts and crafts room wall of downtown Chapel Hill's Kidzu Children's Museum as part of her summer service.

"[The museum] kinda had some things they wanted to incorporate—like some words 'Play, Create, Imagine, Design.' They basically wanted me to incorporate it in the design, but for the most part, I had free reign of the design," reported Zhu.

Working with one of the museum's managers, Zhu churned out sketches of the

designs and then sent them to be approved. "It's going to be abstract and kind of organic... the shapes are vaguely reminiscent of leaves and stuff, and then they're filled in with swirlies and designs and stuff."



Violette Zhu hard at work on a design for a museum wall. This work will fulfill her summer service requirement.

Currently, Zhu and museum manager Carter are the only individuals working on the wall. The two are trying to complete the arts and crafts room wall by themselves, but if Zhu cannot finish this summer before she moves into NCSSM, they might have to bring in more people and more help. As of Monday, August 11th, a third of the wall is done, but Zhu admits that they might

have to repaint and retouch certain parts of the wall.

"It's really exciting; I think I was offered a very unique opportunity...it's nice to have a lasting impact," Zhu said. While the kids she works with come and go, she pointed out,

"the wall is permanent and it's there to stay. It's like leaving a footprint."

The mural will remain up at the Kidzu Children's museum for at least six months, but the museum changes its exhibits and appearance every once in a while. However, because Zhu's design is painted on the wall, it should stay up for a relatively long time unless another design is later painted over it.

Senior Ben Stone also had daily interaction with children for his summer service, but he completed his service farther from home. Accompanying his church on a mission trip, Stone traveled to the poorest country in the Western hemisphere:

Haiti. When his group landed in Haiti, its members got their first glimpse of the country's poverty when they were bombarded with people asking to carry their luggage. "It's how they make a living," commented Stone.

As motivation from the beach mission ministry, the children receive food and are paid to attend school. The group's members were paired with local children who are a part of the ministry, with whom they spent more time.

Stone shared information on his assigned child, Jetson. "His mom's up for murder, his dad's a bum. He has a learning disability, but he still smiles a lot. [He] shared some eggs when we gave them eggs, even though he's starving."

Comprehensive Development Project (CODEP), the primary work and ministry of Haiti Fund, Inc. and the organization that Stone's group worked with, runs a system to benefit

the Haitians. To earn points, Haitians do tasks that CODEP supports: planting trees to prevent erosion, having a garden to improve their own nutrition, and participating in family planning and birth control.

The Haitians can then use the points to get a house, which takes about eight years of saving to occur. Stone's missionary group helped people cash in their points, as well as put in a concrete floor on a CODEP house and install water cisterns on other houses. The water cisterns capture the water off the roof and put it in 500 gallon containers, so that the Haitians are able to have clean water.

"[This experience] puts things in perspective. We're all pretty spoiled here...the poorest people here don't really have anything on them, so it makes you kind of step back and realize 'hey, we're all really lucky, and we can get over it [if] we didn't get the latest iPhone.'"

Summer Service weekly journals and timesheets are due at the Bryan Front Desk by August 21st, supervisor evaluations are due to the Bryan Front Desk by August 31st, and sign up for Summer Service presentations can be found at the Bryan Front Desk August 31-September 11, 2009.